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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/270,768	03/17/1999	ALASTAIR SIBBALD	3017/47588	2922

40032 7590 05/17/2006

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EXAMINER

SELLERS, DANIEL R

ART UNIT PAPER NUMBER

2615

DATE MAILED: 05/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/270,768

Applicant(s)

SIBBALD ET AL.

Examiner

Daniel R. Sellers

Art Unit

2615

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 13-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-10 and 13-15 is/are rejected.
- 7) ☒ Claim(s) 3 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 November 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed March 1, 2006 with respect to claims 1-10 and 13-15 have been fully considered but are not persuasive as detailed below.

On page 8 the applicant has stated, in part, "Fujita teaches only direction dependant attenuation of the signal's low frequency component." The examiner respectfully disagrees. Fujita teaches high frequency cut filtering, or low-pass filtering, in Fig. 11 and Fig. 3, unit 10. The control of the level contribution units 101 and 102 allow for a corrected signal to be output and routed to the time difference signal producing means, wherein the combination of the output signals of 101 and 102 have different frequency content according to Fig. 13. Figure 13 shows that level 7, or control unit 101, controls the HF-cut filtering, or low-pass filtering (Col. 18, lines 62-65), so that the HF-cut filtering is settable according to the direction of the virtual sound source relative to the preferred position (Col. 18, lines 65-67). The examiner further disagrees, insofar as Fujita teaches substantially the same HF-filtering in the left and right channels (see the following rejections under 35 USC 103).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claims 1-2, 4, 5, 7-8, 10, and 13-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujita (previously cited).

Fujita discloses a sound image control apparatus implementing left and right head related transfer functions.

Specifically regarding **Claim 1**, Fujita teaches:

A method of processing a single channel audio signal (input Figure 3, col. 12, lines 48-51)

to provide an audio signal having left and right channels (col. 12, lines 55-57; output of 11, Figure 3)

corresponding to a virtual sound source at a given direction in space relative to a preferred position of a listener in use (angles are relative to user, Figure 2; direction from CPU, col. 12, lines 51-55; col. 19, lines 6-27),

the space including a forward hemisphere and a rearward hemisphere relative to said preferred position (three dimensional space, col. 1, lines 12-18),

the information in the channels including cues for perception of the direction of said single channel audio signal from said preferred position (col. 19, lines 6-27), the method including the steps of:

i) providing a two channel signal having the same single channel audio signal in each of the two channels (delayed versions of same signal are in both outputs of 11, col. 12, line 64 - col. 13, line 11); and

ii) binaural processing the two channel signal using one of a plurality of head response transfer functions (HRTF)(function of 13, col. 14, line 22 – col. 17, line 42; filter values vary according to position data; also see Figure 22, elements 32,33, col. 25, line 42 – col. 27, line 47)

to provide a right signal in one channel for the right ear of a listener and a left signal in the other channel for the left ear of the listener (output of 13 to headphones, col. 19, lines 13-49)

wherein the binaural processing of the two channel signal is augmented (sound quality, as affected by 13, is corrected by 10)

using high frequency (HF)-cut filtering (function of 10, comprising processing of low pass filtering 100 and gain 101, col. 18, lines 14-16) for virtual source positions in the rearward hemisphere (gain of 101 operates for 90-180°, Figure 13, col. 18, lines 54-67),

the degree of the HF-cut filtering being settable according to the given direction of the virtual sound source relative to said preferred position (amount of gain shown in Figure 13, col. 18, lines 62-65) and wherein the amount of HF cut filtering is substantially the same for each of the left and right channels (Col. 11, lines 46-48, Fig. 3, unit 10, Fig. 11, and in view of the prior art Fig. 1).

Fujita teaches the reduction of hardware, wherein a relative HRTF is used (Col. 6, line 49 – Col. 7, line 6), and Fujita teaches that an HRTF has been used for both the left and right audio signals prior to the current invention (Fig. 1 and Col. 1, line 10 – Col. 5, line 34). It would have been obvious for one of ordinary skill in the art at the time of

the invention to combine the teachings of Fujita's prior art and the inventive teachings of Fujita for the purpose of better sound quality (Col. 12, lines 58-63).

Regarding **Claim 2**, Fujita teaches:

the amount of HF-cut filtering is at a maximum for virtual sound sources placed directly behind the preferred position of the listener, that is, at a direction of azimuth $+180^\circ$ and elevation 0° relative to the preferred position of the listener (gain is maximum at 180° , Figure 13; as image is localized in 3d space, col. 19, lines 6-12, the maximum value shown in Figure 13 includes elevations), and

the amount of HF-cut filtering progressively decreases as the forward hemisphere is approached (decrease shown before 90° in Figure 13).

Regarding **Claim 4**, Fujita teaches:

the left and right channel signals (outputs of 1, Figure 14) are processed by transaural crosstalk cancellation means (Figure 15) in order to give loudspeaker compatible signals (col. 19, lines 60-67; col. 20, lines 1-9).

Regarding **Claim 5**, Fujita teaches:

the degree of HF-cut filtering is determined by filter coefficients (settings of 101) set according to a function of the angle of azimuth and the angle of elevation of the virtual sound source (3-dimensional sound set according to source location data, col. 18, lines 16-19; col. 19, lines 6-12).

Regarding **Claim 6**, Fujita teaches:

the amount of HF-cut filtering (gain of 101) is substantially the same for virtual sound sources placed at positions on the rear hemisphere which are equidistant from

azimuth $\pm 180^\circ$ and elevation 0° relative to the preferred position of the listener (filtering applied commonly, thus symmetrically, to input signals, Figure 3)

Regarding **Claim 7**, Fujita teaches:

the degree of HF-cut filtering (by 10) is determined by filter coefficients set via a look-up table (data memory, col. 25, lines 42-56).

Regarding **Claim 8**, Fujita teaches:

the HF-cut filtering (by 10) is performed in series with an HRTF (13) (Figures 3,22; col. 26, lines 40-44).

Regarding **Claim 10**, please refer to the above rejection of the method recited in Claim 1, noting that Fujita teaches:

including signal processing means (DSP)(col. 12, lines 38-48), HRTF filter means (13 or 32,33), HF-cut filter means (10) and a means (data memory) for determining HF-cut filter coefficients as a function of the direction of the virtual sound source (col. 25, lines 42-64).

Regarding **Claim 13**, please see the above rejection of the similar limitations of Claim 1, noting that the system may be implemented as software running on a DSP (col. 12, lines 46-48).

Regarding **Claim 14**, please refer to the above rejection of similar limitations of Claim 1, noting that the system of Fujita produces an audio signal(col. 19, lines 22-27).

Regarding **Claim 15**, please refer to the above rejection of similar limitations of Claims 1 and 10.

4. **Claims 6 and 9** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujita as applied to claim 1 above, and further in view of Gardner (previously cited).

Regarding **Claim 6**, Fujita teaches the features of claim 1, but does not implicitly teach the features of claim 6. However, Gardner teaches:
the amount of HF-cut filtering (gain of $400_L, 400_R$) is substantially the same for virtual sound sources placed at positions on the rear hemisphere which are equidistant from azimuth $\pm 180^\circ$ and elevation 0° relative to the preferred position of the listener (inherent, gains derived from HTRFs, for virtual sources outside physical speaker locations, total power transfer into two ears equals total power transfer in the HRTFs, KEMAR head shadowing is symmetrical; col. 15, lines 42-60; col. 16, lines 3-49).

It would have been obvious for one of ordinary skill in the art at the time of the invention to combine the teachings of Fujita and Gardner for the purpose of providing head tracking movement for the listener.

Regarding **Claim 9**, Gardner teaches:
an HRTF is convolved with an HF-cut filter to produce a modified HRTF (equation 31, col. 16, lines 5-15).

Allowable Subject Matter

5. **Claim 3** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


The applicant is reminded that Technology Center 2600 has undergone restructuring as of March 19, 2006. Any **further communication** regarding this application should **indicate the new Art Unit 2615** (old art unit 2644).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel R. Sellers whose telephone number is 571-272-7528. The examiner can normally be reached on Monday to Friday, 9am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sinh Tran can be reached on (571)272-7564. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DRS



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SUPERVISORY PATENT EXAMINER